



Place Schemas & Opportunities for services

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Place schemas are useful because they:

- enumerate/describe location based services/devices, which enables location-based search for resources (pull services)
- allow smart filtering of incoming service offers in one's immediate surroundings (push services)
- can describe locational context aspects of user state, which can enhance the quality of either pull or push service management

A noun/adjective/verb/adverb approach to place schemas is outlined below. First, though, I outline how agreed-upon descriptions can enable business opportunities.

Services enabled by place schemas

The following services are outlined below:

- Name resolution
- Trust
- Topology
- Etiquette/rules

Name Resolution Services

An agreed schema allows mutual intelligibility when systems are trying to find others and describe themselves. A "noun/adjective/verb" approach is described below.

Since the semantic content of places changes at various degrees of resolution -- e.g. when I'm in a room the details of the house's neighborhood is unlikely to be relevant -- the names used may vary at different granularities. One of the features of a naming service may be to translate between equivalent descriptions that apply at different resolutions or in different contexts. For example, an airline maintenance crew might describe a defective seat as

seat127.Boeing#123456

while the cabin crew uses

seat23C.FlightAlaska900.24June1999.GateC9.Seatac

At some point sophisticated recognition systems may reduce the need for precise definitions conforming to a schema. To the extent that a description like "the old inkjet printer in my office" is unique, the system will be able to map that to the function required. It will probably use a unique descriptor during processing, but this descriptor may be local and not global.

Trust Services

Verifying the identity of a place or person is another aspect of a comprehensive naming service. Customers will want some reassurance that a place, place-based service or individual is, indeed, who they purport to be. For example, I would want to be certain that a dinner reservation is in fact with the restaurant I have in mind, and is not being maliciously



spoofed. This validation may be quite granular. Using a person as an example: John Doe's identity is separate from the claim that he has signed an NDA with my company, and thus is a trusted recipient of the data he's asking me to IR to him.

A Market Maker is an extended trust service: It's a third party which guarantees that a transaction can and will take place under the terms agreed by the 1st and 2nd parties. Such services are normally already in place for well-established venues, e.g. a stock exchange or shopping center. However, ad hoc trust services can be useful for exhibitions, yard sales and car boot sales (?find American English term).

Topology services

The spatial and social barriers between different locations are not encoded in a simple grid locator. A service could offer to resolve, say, whether a product vendor in a sports venue is on the right side of the stadium boundary, or which of two places is in fact closest in terms of elapsed time walking from one's current position.

This service will have high value since collecting the baseline information for resolving queries will be laborious. Compare, for example, NavTech's pre-eminent position in GPS navigation services to their on-going investment in sending people out to find one-way streets, update roadwork status, etc.

Etiquette/rules services

People are reasonably smart about observing the social rules of a place, e.g. whether asides are allowed in a given meeting, who defers to whom, whether using a tape recorder is appropriate, etc. As companion devices become pervasive, they will also need to observe place-based rules, for example:

- switching off an audio alert on a PDA in a meeting
- not allowing a cellphone connected to a laptop with Bluetooth to attempt a call if the device is in an airborne plane
- automatically exchanging vCard info in a business meeting, but not on a trade show floor

The enforcement of "place rules" for devices will probably follow human precedents, e.g. being voluntary in some cases and mandatory in others. Devices will probably have greater need for Rule Authorities and Arbiters of Etiquette than humans, however. An etiquette service could (a) advertise/impose rules in specific places, and/or (b) offer to interpret application of those rules for particular devices.

(Since a device's observance of rules may correlate with its owner's status, "status descriptors" for devices should be incorporated into the schema architecture.)

A place schema

I find a linguistic approach useful:

"<Verb> the <noun> in state <adjective> in an <adverb> way."

I believe this approach will work for people and things just as well as for places; however, I'll focus on the latter.

Nouns

A location can be described by a tuple in some geometric grid system, e.g. (latitude, longitude, altitude). The tuple can have varying degrees of precision; e.g. for street navigation the altitude is normally ignored, and horizontal location within a few feet is sufficient.

A variety of hierarchical description systems are used for buildings and street addresses.

- "Western" street address: 10024 Slater Ave NE, Kirkland, WA, USA (linear hierarchy at the street level of detail)
- USPS address: Carrier route C066, county KING, Delivery Point 24, Check Digit 0
- "Japanese" street address: 2-15 Matsuba-cho, Kadoma-shi, Osaka, Japan (nested hierarchy at the street/neighborhood level)

Note that elements of a descriptor may be redundant, e.g. unique gate numbers in airports which are prefixed by terminal letters (e.g. Gate C 23) in order to guide passengers to the correct terminal. This is not necessarily the case, though; at SeaTac for example, gates C11 and D11 are distinct.

Places can also be defined by their affiliation with other entities whose locations are known in other description systems, e.g.

- Seat C1055; Kingdome; Seattle
- Seat C1055; Mariner's home game; 12th June 1999

Since the layout of places may change (e.g. in convention centers and arenas catering for different sports), the date may become a critical (and variable) part of the schema for a place, e.g.

- May 24th, 1999; Seat C1055; Kingdome <redundant descriptor: Mariners/Orioles game>

and

- January 23rd, 1999; Booth 761; Kingdome <redundant descriptor: Seattle Boat Show>

may both describe the same spatial location

Adjectives

Once within a place, it's "noun" location is often of secondary importance. For example, once on a flight to San Francisco the fact that I'm airborne and cellular phone calls are not allowed may be more useful to my devices than the flight number.

Adjectives can be used to describe the properties of places. (Debatable question: how to draw the line between adjectives and nouns. Since the location/affiliation of a place is also a property, it could be argued that these attributes are also adjectives, not nouns as implicitly defined above. I take the approach that attributes that are not changeable should be used in the Noun description, whereas variably attributes are counted as adjectives.)

I make a further distinction between "absolute" and "relational" adjectives. Relational adjectives are dependent on other entities for their meaning.

Examples of relational adjectives

- Is inside/outside/beside/above place W
- Is reachable by X means
- Is accessible by Y entity

- The following rules of <noun> are applicable to entities in {Z}: ...

Examples of absolute adjectives

- Is open for business
- Is a sport shop
- Is a 15 story building with seven exits
- Contains seven shoe stores, two coffee shops and a tattoo parlor
- Is crowded/empty
- Is owned/controlled/operated by entity X
- Is at cruising altitude, taxiing, at the gate, ...

Verbs

Verbs describe the actions on nouns that actually yield end user benefit. The empirical/semantic/social framework of place outlined in the Appendix is useful as a taxonomy here:

Empirical/physical verbs

- Go to
- Enter/Leave
- Move
- Open/Close
- Activate

Semantic verbs

- Find
- Poll
- Redefine
- Announce

Social verbs

- Ignore
- Purchase
- Affiliate

Adverbs

The actions described by verbs can be qualified by adverbs:

- Slowly
- Comprehensively/summarily
- Urgently
- By the most direct/rapid/scenic route
- Whenever X criterion is met, e.g. at/after a given time, when another entity is present, after some event has occurred,...
- Using specified means, e.g. with X credit card, with Y identity

Appendix: Aspects of Place

Following Robert David Sack's approach (cf. his *Homo Geographicus* 1997), I consider places to be the confluence of three "forces": nature, meaning and social relations. Space, in the sense of empirical geometry, is the aspect of place provided by nature. A place is more than simply a set of dimensions; it is a human construct, and thus has a particular set of meanings, e.g. it's

significance in one's life, or it's symbolism for an ethnic group. Since many people can use a place, social relations determine, for example, what activities are allowed and prohibited in a given space. Of course each of the three forces also has aspects outside of their manifestations in places. Hence Sack's diagram:

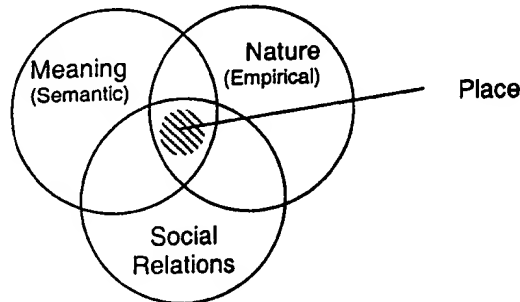


Figure: Aspects of Place

Consider a place where two roads merge as an example of these three aspects:

- **Empirical:** The location of this feature in space, the construction of the applicable road signs, the width of the road are part of the "nature" aspect.
- **Semantic:** The road signs have meaning: a sign indicates that a merge is 200 yards away, a yield sign implies that two streams of traffic will be merging
- **Social:** The social conventions of merging roads, e.g. yielding to traffic coming from the right, also comes into play.

The content of the three aspects become increasingly negotiable and ambiguous as one moves from the empirical through the semantic to the social aspects.

Some other examples of public places where these three aspects can be discerned:

- A "Reserved" sign on a table in a restaurant.
- The lowered counter and placement of a cash register indicating where one orders coffee in a Starbucks.
- A Men's Room sign.
- A Baggage inspection station in an airport.

This framework is useful for itemizing the range of place-based rules required of a device. Consider, for example, a laptop connected to a cellphone with Bluetooth in an airplane:

- **Empirical rules:** frequencies, protocols, interfaces
- **Semantic rules:** identity/ownership of the two devices, the meaning of the place qualifiers "airplane" and "airborne"
- **Social rules:** not using the cellphone to attempt to establish a data connection to the web because of safety concerns

Appendix – Scenario Example: Attending convention

<under construction: on flight, car rental at airport, navigate to convention center, find person, data on product in booth, find restaurant>